MIDWEST CHP APPLICATION CENTER

In Partnership with the US DOE

combined heat & power in ethanol plants

U.S. Energy Partners, LLC
&
City of Russell, Kansas
15.0 MW CHP Application

Fact Sheet

CHP Quick Facts

Location:
Russell, Kansas
Ethanol Capacity:
40 million gallons per year
Process Steam Requirement:
100,000 lb/hr 100 psi steam
CHP Plant Equipment:
Two Solar Taurus™ 70 Gas Turbines
Superior Heat Recovery Equipment
CHP Generating Capacity:
15.0 MW (megawatts)
CHP Maximum Thermal Output:
65,000 lb/hr 100 psi steam
Ethanol Plant CHP Expenditures:
Heat recovery equipment only
Ethanol Plant CHP Installed Cost:
$1 Million
Ethanol Plant Energy Savings:
10-20% Savings on Process Steam utilized from CHP system
CHP System Online:
August 2002

Project Overview

The City of Russell, Kansas, in partnership with U.S. Energy Partners, LLC (a 40 million gallon per year ethanol production facility) has installed a 15 MW Combined Heat and Power (CHP) system. The CHP system provides the total electric requirements of the ethanol plant (3 MW), has the capability of providing up to 65% of the steam requirements of the ethanol production process, and provides 12 MW of electric power to service the citizens of Russell, Kansas and surrounding area.

The CHP system utilizes 2 Solar Taurus™ 70 Gas Turbines (7.5 MW capacity per turbine) with heat recovery steam generators (HRSGs) that recycle the waste heat from the turbines into approximately 65,000 lbs/hr steam that can satisfy up to 2/3 of the thermal requirements of the ethanol production process.

Since the ethanol plant purchases its electricity from the City of Russell, should either or both of the CHP turbines be down for maintenance, power to the ethanol plant is supplied by the remaining power generation assets of the City. The ethanol plant also has a natural gas fueled steam boiler system that provides whatever level of thermal energy is not provided from the CHP system.

The Explosion

Back on August 27, 2000, three explosions rocked the Russell Municipal Power Plant cutting off power to the majority of the City of Russell and surrounding area. For two hours, flames soared high as firefighters from seven neighboring communities assisted in extinguishing the fire.

Within three hours of the explosion, emergency power was restored to the community, but the power plant lost five of the eight engine generators to the ensuing fire. The City of Russell now needed to replace 13.2 MW of electric generating capacity.

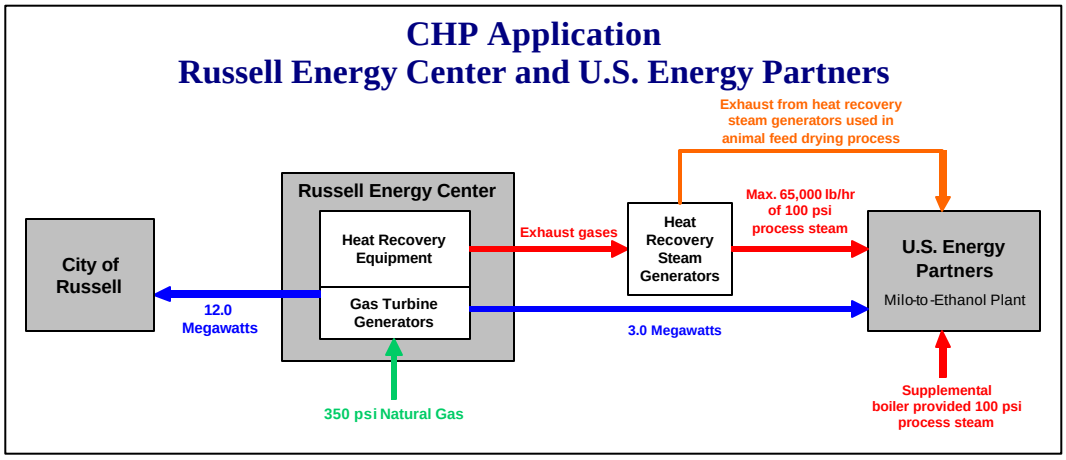
The Solution and Unique CHP Partnership

Faced with replacing 13.2 MW of electric generating capacity, the City of Russell turned to the design engineers of Shafer, Kline & Warren, Inc. (SKW) in early September to investigate several power generating options. After reviewing several options and meeting with Russell's City Council, SKW recommended the application and technologies of Combined Heat and Power.

The new CHP facility, located in Russell's Industrial Park, approximately one mile from the old municipal power plant, would generate 15.0 MW of electricity and provide the potential to capture hot exhaust gases from the electric generating gas turbines for process steam applications. With the location and availability of low cost high-pressure steam, the City of Russell was able to attract a large, new ethanol plant, U.S. Energy Partners, to the industrial park. The ethanol plant would provide many benefits to The City of Russell and the surrounding communities including:

- Utilizing 12 million bushels of milo grown locally by Kansas farmers
- Creating many new jobs at the Ethanol and nearby Gluten Plants and businesses by purchasing goods and services from local merchants

Located adjacent to the Russell Energy Center, the U.S. Energy Partners purchased the CHP heat recovery equipment that would transfer the heat from the hot exhaust gases from the gas turbines and produce process steam that is needed for the ethanol process. The exhaust from the heat recovery units is then used in the animal feed drying process. Through this partnership with the City of Russell, U.S. Energy Partners would experience 10-20% savings on steam purchases and avoid the cost of installing additional boiler capacity for the ethanol plant.



CHP Benefits to the Ethanol Plant

- 65% of the ethanol plant process steam load is supplied by the CHP system when both turbines are operating. The remaining required steam load is supplied by supplemental boilers located at the ethanol plant.
- The Solar Taurus^{TM} 70 Gas Turbines are dual-fuel and can operate on natural gas during standard operation or diesel during emergency power situations.
- The maintenance of the CHP system is contracted out to Solar Turbines, Inc. No additional staffing was required by the City of Russell or U.S. Energy Partners to operate the CHP equipment.
- 3.0 Megawatts of generated electricity is supplied to the ethanol plant at the current municipal electric rates.
- Currently, one turbine is operated due to higher natural gas prices.
- The CHP system reduces the amount of atmospheric pollutants associated with conventional power/steam generation
- CHP project was awarded 2003 EPA CHP Award and 2004 Energy Star Award

For further information contact

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"The CHP facility has been very positive for the ethanol plant and the entire community, not only providing the electric generating capacity, but providing new jobs and business opportunities in the surrounding area."

Ron Dunbar
Plant Manager
U.S. Energy Partners

CHP
EPA COMBINED HEAT AND POWER PARTNERSHIP

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